A COMBINED SALINITY/COUNTERCURRENT STRESS TEST TO EVALUATE STRESS SENSITIVITY OF JUVENILE EUROPEAN SEA BASS Dicentrarchus labrax L.

Peter Couteau, Inge Geurden, Lorena Schwarz and Patrick Sorgeloos

Laboratory of Aquaculture & Artemia Reference Center, University of Gent, Rozier 44, B-9000 Gent, Belgium

Introduction
Very few tools are available for the evaluation of fry quality in marine aquaculture. Stress tests have been developed for shrimp and fish larvae in which mortality during the exposure to air (Watanabe, 1983) or extreme salinity (Tackaert et al., 1989; Dhert et al., 1993) are recorded. Although the latter stress tests give a rough estimate of the overall physiological condition of the larvae and juveniles, they are based on mortality rates under extreme conditions and remain rather rudimentary tools to evaluate quality differences induced by differences in nutritional status. The present paper aims at refining the traditional high salinity stress test.

Materials and methods
The basic methodology of the present stress test is derived from the high salinity stress test described by Dhert et al. (1993). Whereas the traditional test is performed in a static system in which mortality in function of time is recorded, the combined salinity/countercurrent test is done in a raceway system in which the fish can escape from the high salinity by leaving the raceway (Fig. 1). The fish were acclimated to a countercurrent (20–40 mls−1) at a salinity of 30 g l−1, which was changed to a high salinity (e.g. 70 g l−1) over a short time period. The percentage of fish that escaped from each raceway was recorded every 2–5 min during 40 min after the increase of salinity. Each treatment was run in duplicate raceways. The final stress sensitivity index was the sum of the cumulative escape percentages. Preliminary experiments were performed to evaluate the effect of the salinity on the escape rate of the fish. Other initial experiments were run to explore the value of the stress sensitivity for the evaluation of the nutritional condition of juvenile sea bass. In an initial test, juvenile D. labrax (3.7–5.5 mg dry body weight), weaned and ongrown on a commercial weaning diet, were starved for 24h and 48h and subjected to the stress test with a control of fed animals. Further tests were performed with sea bass weaned and ongrown on diets with a different composition, e.g. 0.1 versus 2% dietary n-3 HUFA, 0 versus 2% dietary phospholipids.

Fig. 1. Combined salinity/countercurrent test system
Results and discussion
The preliminary experiment showed that the escape rate of the juvenile sea bass in the countercurrent strongly depended on the salinity, according to the order 110-60-2-33 g.l⁻¹. A salinity of 60-80 g.l⁻¹ resulted in a gradual escape within a period of 40 min and was retained for further experimentation. Only after 48h of starvation the stress index of the fish was considerably higher for starved fish compared to fed fish (Fig. 2). Furthermore, differences of stress sensitivity were demonstrated for fishes fed a diet deficient in (n-3) HUFA or phospholipids versus fishes fed a complete diet.

Fig. 2. Escape rate of fed and starved (A: 24h, B: 48h) juvenile D. labrax as a function of time in the countercurrent system after a salinity change from 33 g.l⁻¹ to 70 g.l⁻¹.

Conclusion
A series of preliminary experiments showed the potential of the combined salinity/countercurrent stress test to evaluate differences in stress sensitivity depending on the nutritional status of sea bass juveniles. The present stress test has several advantages over the traditional test, i.e. the easy observation (passage through the system), the high survival after the stress (mostly over 80%) and the possibility to observe simultaneously a large number of replicates by one experimenter (lower variability). Further experimentation is needed to know the effect of body size on the performance of the stress test.

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References